

Abstract of the Disclosure

VARIABLE FLOW RATE VALVE AND METHOD OF REDUCING WEAR  
ON SAME

In some fuel injectors, a variable flow rate valve is used to control actuation fluid flow rates to and from an intensifier piston. Over time, the variable flow rate valve is subjected to wear that can affect the predictability of the injection rate shape. The present invention reduces variable flow rate valve wear within a fuel injector, at least in part, by guiding a variable flow rate valve member along guide bore walls within a rate shaping path. The rate shaping path and an unrestricted path are defined by an injector body. When in a retracted position, a moveable intensifier piston includes a first hydraulic surface that is exposed to hydraulic pressure in the unrestricted path and a second hydraulic surface that is exposed to hydraulic pressure in the rate shaping path. The variable flow rate valve member defines a central passage with a predetermined flow area and includes a side surface that separates a closing hydraulic surface from an opening hydraulic surface. The side surface includes a plurality of guide surfaces that separate peripheral flow passages.